1.0 PURPOSE/ OBJECTIVE

The purpose of this cost estimate is to provide costs for the removal of vermiculite containing insulation (VCI) and associated asbestos-containing material (ACM), and demolition of the Stimson Lumber Mill in Libby, Montana. The costs include the work for removal of VCI bulk material and asbestos-contaminated soil, including containment, storage, transportation and disposal of generated contaminated materials, decontamination facility, and demolition of the Stimson Lumber mill.

The Stimson Lumber Mill consists of an original structure, approximately 54' by 260' (14,000 SF) and 60' high, along with many building additions. The entire lumber mill is approximately 59,500 SF consisting of approximately 10 rooms, excluding 3 to 4 offices, filled with wood and lumber machinery, supplies, trucks and construction rigs. Most areas of the building are no longer in operation and are vacant. The relevant walls containing VCI are the 60' high walls in the original structure of the building. A small 40' by 40' shop area adjacent to the original structure also contains VCI in a portion of the walls, as well as in the soil surrounding the original building. This cost estimate will include the costs to remediate all of these areas: original building, shop area, and exterior soil, and demolish the building.

2.0 PROCEDURE

The work for this project was split into 8 line items (CW1-5 not used), each detailed in a cost worksheet, labeled CW1-1b through CW1-9. The work items were broken down as follows:

- CW1-1b ACM Personal Protective Equipment (PPE)
- CW1-2 Decontamination Facility
- CW1-3 Containment System
- CW1-4 VCI Bulk Removal
- CW1-6 Asbestos-Contaminated Soil Removal
- CW1-7 Transportation and Disposal
- CW1-8 Demolition PPE
- CW1-9 Building Demolition

The cost worksheets were then summarized in a Cost Summary, CS-2. Cost worksheets and summary are attached.

3.0 DATA/REFERENCES

Information for the details of the Stimson Lumber Mill building, including size and type of building, were obtained from the Supplemental Interior Inspection Checklist (SIIC). A copy of the Stimson Lumber Mill SIIC is attached for reference.

Costs for each item in the cost estimate were obtained from one or more of the following sources: published MEANS and ECHOS cost books, local vendor quotes, and previous work performed by CDM Federal.

Several cost adjustments were made based on the following factors:

H&S Productivity (labor and equipment only) – Some field work will be performed in Level C PPE. A productivity factor (HPF) of 0.55 is applied to labor and equipment unit costs derived directly from published

sources. No factor is applied when health and safety impacts have been considered in the estimation of task durations.

Escalation to Base Year – When costs are taken from earlier dated cost sources, adjustments are made to reflect the current cost in 2003. 2001 cost sources are escalated by 3% to 2003 costs (EF=1.03). 2000 cost sources are escalated by 4% to 2003 costs (EF=1.04). 1998 cost sources are escalated by 9% to 2003 costs (EF=1.09). 1996 cost sources are escalated by 17% to 2003 costs (EF=1.17).

Area Cost Factor - An AF of 1.13 is used for Montana, except an AF of 1.00 (national unmodified average) is used for local vendor quotes.

Subcontractor Overhead and Profit - It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.

Prime Contractor Overhead and Profit - It is assumed that home office OH is 5%, and field office OH is 10%. Profit of 8% is used for the Prime Contractor.

Many of these factors were obtained from "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000 and the Engineering News-Record website relating to building cost indexes (http://end.construction.com/featureds/conEco/costIndexes/default.asp).

4.0 ASSUMPTIONS/ LIMITATIONS

The following assumptions were made for the basis of this cost estimate:

- The following durations will be used for each of the listed tasks:
  - Removal of VCI bulk material, inside the original structure and shop area - 14 days
  - ACM soil removal, backfill and compaction – 1day
  - Building Demolition – 5 days

  Therefore, the total duration for this project will be 20 days.
- No detail cleaning of walls and building, encapsulant application or restoration of the wall will be performed.
- A crew of one labor foreman, 5 laborers and 1 vacuum truck driver will be on site for the duration of the work. A site manager will also be on site half-time.
- Personal Protective Equipment (PPE) for the duration of the removal of VCI and ACM material will include respirators, disposable coveralls, gloves, foot covering, and protective eye wear.
- Decontamination area will be provided for the decontamination of employees, materials, and their equipment.
- Area warning signs and warning tapes will be provided at the regulated boundaries and entrances to regulated areas. Disposal warning labels will be attached to each asbestos disposal container removed from the abatement area.
- The entire building will serve as the containment area. All openings will be sealed and negative air pressure provided (air lock, 60-mil polyethylene over all windows, doors, wall openings, electrical outlets, etc, use duct tape to provide airtight seal). HEPA-filter vacuum cleaner and a HEPA-filter ventilation system will be provided in the work area.
- The original structure is 60' tall, and all other walls are 25' tall in the building. VCI will be removed from the entire height of affected walls.
- Removal of the VCI will include removing the lapboards from the interior wall and vacuuming material directly into vacuum boxes, each holding 25 CY. These vacuum boxes will be transported to an asbestos landfill for proper disposal. Lapboards will also be disposed of at the asbestos landfill.

- Vacuum boxes are currently mobilized on site for the Libby Asbestos Project. It is assumed that these boxes will be used for this property as well.
- The entire building frame will be demolished. Concrete foundation and any other at grade slabs will remain. It is the owner's responsibility to remove all equipment prior to demolition activities. Miscellaneous cleaning of equipment will be provided during VCI removal.
- Asbestos contaminated soil will be removed from the exterior perimeter of the building, along the north and east walls. These locations coincide with the exterior wall locations of the original building. It is assumed that approximately half of this outside area is paved. The paved area will be vacuumed for surficial material. The assumed dimensions of the contaminated soil material are 10 feet wide by 6 inches deep. This material will be loosened, vacuumed into the vacuum boxes, and disposed of at the asbestos landfill. The area will then be backfilled and compacted with clean soil.

These assumptions are based on the process currently being performed at other locations at the Libby Asbestos Project for removal of VCI and ACM. This cost estimate is unique in that the size of the building is large, and therefore requires additional equipment, material and laborers. This cost estimate is an approximation and is based on approximated building dimensions and remediation durations.

5.0 CALCULATION

This section contains the calculations and assumptions for each line item in the cost estimate.

5.1 ACM Personal Protective Equipment (CW1-1b)

It is assumed that the workers in containment area (5 laborers, 1 vacuum truck driver) will need 2 sets of Level C PPE per day for the duration of the VCI bulk removal and asbestos contaminated soil removal.

PPE needed = 6 people x 2 sets x 15 days = 180 each

In addition, the workers plus the foreman and site manager will need 2-way radios = 8 radios

5.2 Portable Decontamination Facility (CW1-2)

This line item includes set-up and removal fee for a portable decontamination facility for decontamination of employees, materials and equipment for the duration of the project. It is assumed an outside contractor will set-up and remove the facility. Decontamination material is to be disposed of with all other contaminated material.

5.3 Building Containment (CW1-3)

The entire original building area will be used as containment. Doors, windows, vents, etc. will be sealed off using polyethylene sheeting.

Quantity of polyethylene needed=

	Length, ft	Width, ft	Area, SF
2 doors	15	15	450
4 doors	10	10	400
2 doors	6	6	72
6 windows	4	4	96
Total			1018
Add 10 % safety factor (to account for vents, etc.)			**1120**

It is assumed a negative air vacuum will be needed at each door and window (excluding main entrance door), in order to provide adequate pressure for containment. If this pressure is not adequate, additional polyethylene sheeting will be needed to partition off portions of the room, and perform VCI removal in sections. For this cost estimate it is assumed that **13 vacuums** will be adequate.

5.4 VCI Bulk Removal (CW1-4)

The 5 laborers, 1 foreman, and 1 vacuum truck and driver will be on-site for the duration of the VCI bulk removal, 14 days. The site manager will be on site part time.

Laborer hours for VCI removal = 14 days x 8 hours/day x 5 laborers = **560 hours**

Foreman hours for VCI removal = 14 days x 8 hours/day x 1 foreman = **112 hours**

Vacuum Truck and driver time = 14 days * 8 hours/day = **112 hours**
(cost includes time for driver and truck)

Site manager hours for VCI removal = 14 days x 4 hours/day = **56 hours**

This section also includes the cost for a scissors lift, capable of lifting up to 60' high, the height of the original structure's walls.

5.5 Cleaning and Restoration (CW1-5)

This task will not be performed. It is assumed that only VCI bulk removal will be necessary prior to building demolition.

5.6 Asbestos-Contaminated Soil Removal (CW1-6)

Asbestos-containing soil has been visually seen in the soil along the exterior perimeter of the original structure. Since a portion of this exterior is paved, it is assumed that approximately half of the exterior perimeter will need to be removed, assuming approximately 10' wide by 6" deep.

Volume of soil:

	Perimeter length, ft.
North Side	424
East Side	140
Total:	564
Assume half of this area:	282

SF of area = 282' x 10' wide =2,820 SF
Volume = 2,820 SF x 6" deep = 1,410 CF
= 1,410 CF * 1CY/27 CF = **52 CY**

The soil will be loosened and then vacuumed into the vacuum boxes, similar to the VCI removal. Once the soil is removed, the area will be backfilled and compacted with clean soil.

Total labor hours for soil removal, backfill and compaction will include the 5 laborers and 1 foreman for 1 day and the site manager for 0.5 days. The vacuum truck and truck driver will also be needed for 1 day.

5.7 Transportation and Disposal (CW1-7)

This line item includes the transportation and disposal costs for each vacuum box to the asbestos landfill. The number of vacuum boxes is calculated by first calculating the volume of material being transported to the landfill, including VCI material, ACM soil, miscellaneous ACM material and decontamination material. It is assumed that the VCI is approximately ½' thick.

Asbestos landfill disposal volumes

	Thickness, ft.	Area, SF	Volume, SF	Volume, CY
VCI material	0.5	41338	20669	766
Asbestos-contaminated soil				52
Lapboards - 1/2" thick	0.041	41338	1695	63
Total				881
Add 10% for misc.:				**969**

It is assumed that the vacuum boxes that are already mobilized on site for other properties at the Libby Asbestos Project will be used. Therefore, there will be no cost for the vacuum boxes themselves. The number of vacuum boxes will need to be calculated for disposal. Current disposal rates are $200 per vacuum box.

The quantity of boxes will be based on the total volume of asbestos contaminated material. Each vacuum box can hold 25 CY of material.

Vacuum boxes for disposal = 969 CY / 25CY = **39 boxes**

5.8 Demolition Personal Protective Equipment (CW1-8)

It is assumed that the workers during demolition activities (5 laborers, 1 foreman) will need 2 sets of Level D PPE per day for the duration of the demolition. This PPE includes disposable tyvek coveralls and ear plugs.

PPE needed = 6 people x 2 sets x 5 days = 60 each

In addition, the laborers plus the foreman and site manager will need 2-way radios = 7 radios

5.9 Building Demolition (CW1-9)

Building demolition costs were based on a cost per cubic foot of the entire building. Labor costs are built into this unit price. The building heights were assumed to be 60' in the original structure and 25' in the rest of the building. Based on the dimensions from the SIIC, the following volume was calculated:

	Length, ft	Width, ft	Height, ft	Volume, CF
Original Structure	260	54	60	842,400
Un-insulated area	115	64	25	184,000
Machine shop area and misc.	100	149	25	372,500
Wood shop, offices and misc.	260	86	25	559,000
				1,957,900

Since there are minimal interior walls and no multilevel floors in this large building, half of the total volume was used for calculation. A MEANS book cost for a non-explosive demolition of a steel, multi-level building was used per CF of building, and assumed to be the approximate same cost for wood.

Total volume for demolition cost = 1,957,900 / 2 = **978,950 CF**

The volume of demolished material is calculated based on the following assumptions:

- Interior walls and exterior walls are wood, approximately ½" thick each
- Original structure's walls and all other exterior 25' high walls were used for the volume calculation. Other interior walls were ignored and assumed minimal.
- Studs inside the walls are 2" by 4"'s, spaced every 2 feet
- Ceiling is approximately 2" thick
- Concrete foundation will not be demolished. Quantity of demolished material is the building structure only.

First, the volume of a stud in both a 60' high wall and a 25' high wall was calculated.

	Length, ft	Width, ft	Height, ft	Volume, CF
Stud Vol (60' high wall)	1/6	1/3	60	**20**
Stud Vol (25' high wall)	1/6	1/3	25	**8**

Next, perimeter distances were calculated for each type of wall.

	Length, ft.
Perimeter distance of 60' high walls (int. and ext.)	260
	260
	54
	54
total 60' high walls:	**628**
Perimeter distance of exterior 25' high walls	164
	115
	64
	34

		360
		140
	Total exterior 25' high walls:	**2,133**

The number of studs per wall and the total stud volume was then calculated. The total volume was calculated by multiplying the number of studs by the associated stud volume, shown above.

# of Studs-60' high	Total perimeter dist(ft):	628 ft	
	1 stud per 2 ft:	314	
		Stud volume(CF):	**6,280**
# of Studs-60' high	Total perimeter dist(ft):	2133 ft	
	1 stud per 2 ft:	1067	
		Stud volume(CF):	**8,888**

The walls and ceiling volumes were calculated based on the assumptions listed above. Since the interior lapboards were already removed and disposed of during VCI bulk removal, only the exterior walls of the original building and 40' of the wood shop are added to the total volume.

	Length, ft	Height, ft	Width, ft.	Volume, CF
Walls	260	60	0.042	655
	260	60	0.042	655
	54	60	0.042	136
	54	60	0.042	136
	164	25	0.083	340
	115	25	0.083	239
	64	25	0.083	133
	34	25	0.083	71
	360	25	0.083	747
	46	25	0.083	95
	40	25	0.042	42
			walls:	**3,249**
	Length, ft	Width, ft	Thickness, ft	Volume, CF
Ceiling	360	149	0.167	8958
	115	64	0.167	1229
			ceiling:	**10,187**

Finally, volume of studs, walls and ceiling were added together:

6,280 CF + 8,888CF + 3,249 CF + 10,187 CF = 28,604 CF
= 1,059 CY

10% was added to account for miscellaneous demolition material:

Total Demolition material = 1,118 CY * 1.10 = **1,165 CY**

6.0 CONCLUSIONS

The cost worksheet summary, CS-2, lists each of the above line items and associated costs, for a total capital cost of $266,752. This cost includes decontamination, PPE, containment system, VCI bulk removal, asbestos-contaminated soil removal, transportation and disposal of contaminated material, and building demolition. Again, this cost estimate is an approximation based on limited dimensions and costs associated with remediating such a large building contaminated with VCI and ACM.